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EXAMINER	
MONDT, JOHANNES P	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 09/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/772,673	KUZMIK, JAN	
	Examiner	Art Unit	
	Johannes P. Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13,22,23 and 26-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13,22,23 and 26-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Amendment filed 6/24/05 forms the basis for this office action. In said Amendment Applicant cancelled claims 14-21, 24 and 25, substantially amended all other previously pending claims through substantial amendment of claims 1, 4, 13, 22, 23 and 26, and added new claims 31-42 (N.B.: the underscore in new claim 37 is inappropriate: the claim is interpreted with inclusion of the underscored portion, which is the clear intention of Applicant). An interview was held shortly after the filing of said Amendment, which helped clarify Applicant's invention and position (see Interview Summary). Comments on Remarks in said Amendment are included below under "Response to Arguments".

Drawings

1. ***Figures 1-3*** should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. ***Claims 1-12*** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. In particular, nothing in the original specification indicates that growing the recited "underlying layer" of claim 1 is instrumental in achieving the cation-polarity layered structure, yet this is claimed through the limitation "with an underlying layer grown to provide a cation-polarity layered structure". Therefore, said limitation constitutes new matter.

3. ***Claims 13, 31 and 34-36*** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. In particular, nothing in the original specification teaches that said layer is "grown to provide cation-polarity" as recited in claim 13, hence is instrumental in achieving the cation-polarity layered structure Therefore, this limitation constitutes new matter.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. ***Claim 4*** recites the limitation "the range" in line 5. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. ***Claims 1-6, 8, 9, 11, 13, 22, 23, 25-30, 40*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art by Applicant (APAA) in view of Kim et al (Applied Physics Letters 71(6), 800-802 (1997)).

On claims 1, 2 and 23: APAA teaches (Figure 3 and section [0009]) a hetero-interface field effect transistor comprising:

a substrate (cf. Figure 3 and [0009]); and

a layered QW ([0010]) structure including at least a barrier layer 43 in contact with a channel layer 42 (loc.cit.) in contact with an underlying layer 41 (loc.cit.), thus providing a cation-polarity layered structure including at least said barrier layer and said channel layer (loc.cit.) and wherein said channel layer 42 includes polarization induced charge (line 4 of [0010]). The limitation "grown to provide" said cation-polarity layered structure is functional language: In reference to the functional limitation, intended use

and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963).

APAA does not teach said barrier layer to include $In_xAl_{1-x}N$ with x being in the range $0 \leq x \leq 0.3$. However, it would have been obvious to include $In_xAl_{1-x}N$ in said barrier layer in view of the specific teaching by Kim et al, who specifically teach the selection of $In_xAl_{1-x}N$ as a superior material for a heterojunction barrier layer abutting GaN in inter alia high electron mobility transistors (cf. title, abstract and page 802, first column, central paragraph; N.B.: in this respect it is noted that the device as disclosed in APAA is indeed a high electron mobility transistor: see e.g., [0009], line 2 or [0010], line 1) because of an achievable band-gap energy difference with the abutting GaN layer of at least 670 meV (loc.cit.) (for a lattice-matched system, portending higher mobility due to fewer scattering centers) and up to about 970 meV (loc.cit.). The value of the stoichiometric parameter in the prior art is preferably x=0.08, which overlaps with the range as claimed, or x=0.17 (claim 2). Applicant is reminded that a *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003). *Motivation* to include the teaching by Kim et al in the APAA at least directly connects to

the high band-gap energy jump at the interface, thus increasing the density of electrons confinable, which is the very purpose of the barrier layer in any HEMT (high mobility electron transistor) (loc.cit.).

Finally, *claim 23* merely states that the device of claim 1 would necessarily have to be formed in order to function. Claim 23 fails to further limit the device of claim 1 other than simply form each of their components.

On claims 3, 6, 9, 27 and 30: said channel 42 includes GaN (cf. section [0009]).

On claim 5 and 29: said barrier includes $In_xAl_{1-x}N$, x being in the range as given (cf. Kim et al, page 802, central paragraph of first column).

On claim 8: said barrier layer by Kim et al has x in the range that includes a limiting point of the range as claimed, namely: x=0.17. This value is not part of the range as claimed, but is infinitesimally close to it. Applicant is reminded that a *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003). In the underlying case, one skilled in the art would expect an infinitesimal, i.e., arbitrarily small, increase in the stoichiometric parameter x not to change the properties of the transistor other than by an arbitrarily small, hence insignificant amount.

*On claim 11:*said barrier layer includes InxAl1-xN, x being in the range of *about* $0.25 < x < 0.30$, namely 0.17.

On claims 13 and 22: APAA teaches (Figure 3 and section [0009]) a hetero-interface field effect transistor comprising:

a substrate (cf. Figure 3); and

a layered QW structure (section [0009]) including at least a barrier layer 43 in contact with a channel layer 42 in contact with a layer 41. The further limitation "grown to provide cation polarity" is functional language considering there is cation polarity. In reference to this functional limitation, Applicant is reminded that intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963).

APAA does not necessarily teach the limitation that said two-dimensional electron gas density is above $n_{total} = 1.1 \times 10^{13}$ cm^{-2}.

However, it would have been obvious to include said limitation in view of the specific teaching by Kim et al, who specifically teach the selection of $In_xAl_{1-x}N$ as a superior material for a heterojunction barrier layer abutting GaN in inter alia high electron mobility transistors (cf. title, abstract and page 802, first column, central paragraph) because of an achievable band-gap energy difference with the abutting GaN layer of at least 670 meV (loc.cit.) (for a lattice-matched system, portending higher mobility due to fewer scattering centers) and as high as 970 meV (loc.cit.) for x=0.17 which inherently creates the material conditions to generate a two-dimensional electron

gas of density as claimed. The value of the stoichiometric parameter in the prior art is preferably x=0.08, which overlaps with the range as claimed, or x=0.17. Applicant is reminded that a *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003).

Motivation to include the teaching by Kim et al in the APAA at least directly connects to the high band-gap energy jump at the interface, thus increasing the density of electrons confinable (loc.cit.).

Finally, claim 22 merely states that the device of claim 13 would necessarily have to be formed in order to function, whereas claim 40 is met as said channel layer includes GaN. Claim 22 fails to further limit the device of claim 22 other than simply form each of their components.

On claim 25: the claimed method is merely implied by a method of using the invention as described by APAA in any electronic device comprising any electronic circuit: the hetero-interface field effect transistor of Figure 3 has a substrate (cf. Figure 3); and a layered QW structure (cf. section [0009]) including at least a barrier layer 43 and a channel layer 42 providing a polarization-induced charge (inherent spontaneous polarization ΔP_0 (cf. section [0010]). The mere presence of source, gate and drain already implies both an electronic circuit and an electronic device. Therefore, the claimed method is obvious over the device as claimed for instance by claim 13.

On claims 26-27: the claimed method is merely implied by a method of using the invention as described by APAA in any electronic device: the hetero-interface field effect transistor of Figure 3 comprises a substrate (cf. Figure 3); and a layered QW structure (cf. section [0009]) including at least a barrier layer 43 and a GaN comprising channel layer 42 providing a polarization-induced charge (inherent spontaneous polarization ΔP_0 (cf. section [0010]). The mere presence of source, gate and drain already implies both an electronic device. The newly added limitation "enabling open channel drain current above 1.5 A/mm is satisfied in a wide range around the disclosed value of x=0.17 (see Figure 6 of Applicant's own admitted relationship between gate voltage and drain current in this regard. Therefore, the claimed method is obvious over the device as claimed for instance by claim 13.

On claim 31: said barrier layer includes InxAl1-xN with 0.08 (loc.cit.).

On claim 32: said channel layer includes GaN (loc.cit.).

4. ***Claims 14, 15, 20, 21 and 24*** are rejected under 35 U.S.C. 103(a) as being unpatentable over APAA and Kim et al as applied to claims 1 and 13 above, and further in view of Tateno (6,242,766 B1). As detailed above, claims 1 and 13 are unpatentable over APAA in view of Kim et al. *Neither necessarily teach* the further limitations as defined by any of claims 14, 15, 20 and 21. *However, it would have been obvious* to include said limitations in view of Tateno, who, in a patent on a high electron mobility transistor (cf. title), - hence related art, teaches the application of HEMTS to portable telephone, satellite broadcasting, communication systems, and satellite communication systems for the specific purpose of achieving high power at ultra-high frequency (col. 1,

l. 10-22). *Motivation* to include the teaching by Tateno in the invention as described by APAA thus simply derives from applying the transistor by APAA to obvious applications, thus increasing the net return on investment by increasing the variety of applications of said invention.

Finally, claim 24 merely states that the device of claim 15 would necessarily have to be formed in order to function. Claim 24 fails to further limit the device of claim 15 other than simply form each of their components.

5. ***Claims 16 and 17*** are rejected under 35 U.S.C. 103(a) as being unpatentable over APAA and Kim et al as applied to claims 1 and 13 above, and further in view of Larson (5,554,865). *As detailed above, claims 1 and 13 are unpatentable* over APAA in view of Kim et al. *Neither necessarily teach* the further limitations of claims 16 or 17. *However, it would have been obvious* to include said further limitations in view of Larson, who, in a patent on a low noise amplifier for a radar system (cf. title and abstract), teach the selection of a high electron mobility transistor as the basis for the low noise amplifier because of the superior high frequency noise figure (e.g., 6 db at 58 GHz) (cf. col. 1, l. 6-64). *Motivation* to include the teaching by Larson in the invention as described by APAA derives from the obvious application of the HEMT as a superior low noise amplifier at high frequency, thus increasing the net return on investment by increasing the variety of applications of the invention.

6. ***Claim 18*** is rejected under 35 U.S.C. 103(a) as being unpatentable over APAA as applied to claim 1 and claim 13 above, and further in view of White (EP 0 606 776 A2). *As detailed above, claims 1 and 13 are unpatentable* over APAA in view of Kim et

al. *Neither necessarily teach the further limitation* of claim 18. *However, it would have been obvious to include* said further limitations in view of White, who, in a patent application on THz radiation and detection (title and abstract) teaches a HEMT circuit structure for sensing inter sub-band transitions as part of an optical sensor (cf. Figure 6 and column 7, l. 15-55). The teaching of a HEMT circuit for this purpose is obvious because high electron mobility transistors are superior low noise amplifiers at extremely high frequency such as THz. *Motivation* to include the teaching by White in the invention as described by APAA derives from the obvious application of the HEMT as a superior low noise amplifier at high frequency, thus increasing the net return on investment by increasing the variety of applications of the invention.

7. ***Claim 19*** is rejected under 35 U.S.C. 103(a) as being unpatentable over APAA and Kim et al as applied to claims 1 and 13 above, and further in view of Kawasaki (JP06339657A). *As detailed above, claims 1 and 13 are unpatentable* over APAA in view of Kim et al. *Neither necessarily teach the further limitation* of claim 19. *However, it would have been obvious to include* said further limitations in view of Kawasaki, who, in a patent application on the miniaturization of a microwave frequency converting circuit teaches the integration of an intermediate frequency amplifier in a HEMT monolithic integrated circuit (see English abstract, "Constitution") for the specific purpose of miniaturizing the entire circuit and reduce the number of different parts while keeping versatility (see English abstract, "Purpose"). *Motivation* to include the teaching by Kawasaki in the invention as described by APAA derives from the obvious application of a HEMT to a HEMT monolithic integrated circuit including IF-amplifier in a microwave

frequency converting circuit as a known application of HEMT technology, thus increasing the net return on investment by increasing the variety of applications of the invention.

8. ***Claims 4, 7, 10, 12, 28-31, 33-36, 41 and 42*** are rejected under 35 U.S.C. 103(a) as being unpatentable over APAA and Kim et al and Redwing et al (6,727,531 B1; cf. IDS).

APAA teaches a substrate (cf. Figure 3 and [0009]); and

a cation-polarity layered QW ([0010]) structure including at least a barrier layer 43 and a channel layer 43 ([0009]-[0010]).

APAA does not teach (a) said barrier layer to include $In_xAl_{1-x}N$ (in view of rejection of claim 28 given below thus meeting the limitation of claim 29) with x being in the range $0 \leq x \leq 0.3$, nor *(b)* said channel layer to include InyGa1-yN with y being in the 9i.e.: a) range to provide compressive strain in said channel layer. However:

ad (a) it would have been obvious to include $In_xAl_{1-x}N$ in said barrier layer in view of the specific teaching by Kim et al, who specifically teach the selection of $In_xAl_{1-x}N$ as a superior material for a heterojunction barrier layer abutting GaN in inter alia high electron mobility transistors (cf. title, abstract and page 802, first column, central paragraph; N.B.: in this respect it is noted that the device as disclosed in APAA is indeed a high electron mobility transistor: see e.g., [0009], line 2 or [0010], line 1) because of an achievable band-gap energy difference with the abutting GaN layer of at least 670 meV (loc.cit.) (for a lattice-matched system, portending higher mobility due to fewer scattering centers) and up to about 970 meV (loc.cit.). The value of the

stoichiometric parameter in the prior art is preferably x=0.08, which overlaps with the range as claimed. Applicant is reminded that a *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003). *Motivation* to include the teaching by Kim et al in the APAA at least directly connects to the high band-gap energy jump at the interface, thus increasing the density of electrons confinable, which is the very purpose of the barrier layer in any HEMT (high mobility electron transistor) (loc.cit.).

Furthermore, ad (b), it would have been obvious to include said further limitation in view of Redwing et al, who teaches the selection of $In_yGa_{1-y}N$ (including GaN: thus meeting claims 30, 33, and 36) with y in the range $0<y\leq1$ as channel material for HEMT devices (cf. title and abstract) (thus meeting claims 7,10, 12 and 28) rather than pure GaN for the specific purpose inter alia of increasing the channel mobility with consequent device characteristics improvements but at equivalent levels of strain as compared with GaN (col. 2, l. 50-67 and col. 3 l. 4-8). Given the values for x (x=0.08 and 0.17 and hence also about 0.17, thus meeting claim 34, and hence, in view of the above: also claim 36)) in the $In_xAl_{1-x}N$ compressive strain is inferred from the existence of compressive strain in $In_{0.10}Ga_{0.90}N$ as admitted by Applicant ([0064]). *Motivation* to include the teaching by Redwing et al in the invention as described by APAA at least derives from said improvements in channel mobility, which is not solely dependent upon

polarity but also depends strongly on carrier trapping and deep level generation identified as major problems in AlGaN/GaN piezoelectric structures for HEMTs by Redwing (col. 1).

Finally, with regard to claims 41 and 42: the devices of claims 26 and 29 would necessarily have to be formed in order to function. Claims 41 and 42 fail to further limit the devices of claims other than simply form each of their components.

9. ***Claim 37-39*** are rejected under 35 U.S.C. 103(a) as being unpatentable over APAA in view of Kim et al (loc.cit.). APAA teach a hetero-interface field effect transistor comprising:

a substrate (cf. Figure 3 and [0009]); and

a layered QW ([0010]) structure including at least a barrier layer 43 in contact with a channel layer 42 (loc.cit.) in contact with an underlying layer 41 (loc.cit.), thus providing a cation-polarity layered structure and hence said channel layer including polarization-induced charge, including at least said barrier layer and said channel layer (loc.cit.) and wherein said channel layer 42 includes polarization induced charge (line 4 of [0010]). The limitation "grown to provide" said cation-polarity layered structure is functional language: In reference to the functional limitation, intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it

meets the claim. In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963).

APAA does not teach said barrier layer to include $In_xAl_{1-x}N$ with x being in the range $0 \leq x \leq 0.3$. However, it would have been obvious to include $In_xAl_{1-x}N$ in said barrier layer in view of the specific teaching by Kim et al, who specifically teach the selection of $In_xAl_{1-x}N$ as a superior material for a heterojunction barrier layer abutting GaN in inter alia high electron mobility transistors (cf. title, abstract and page 802, first column, central paragraph; N.B.: in this respect it is noted that the device as disclosed in APAA is indeed a high electron mobility transistor: see e.g., [0009], line 2 or [0010], line 1) because of an achievable band-gap energy difference with the abutting GaN layer of at least 670 meV (loc.cit.) (for a lattice-matched system, portending higher mobility due to fewer scattering centers) and up to about 970 meV (loc.cit.) The value of the stoichiometric parameter in the prior art is preferably x=0.08 thus exhibiting compressive strain, and which overlaps with the range as claimed. Applicant is reminded that a *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003). *Motivation* to include the teaching by Kim et al in the APAA at least directly connects to the high band-gap energy jump at the interface, thus increasing the density of electrons confinable, which is the very purpose of the barrier layer in any HEMT (high mobility electron transistor) (loc.cit.).

Response to Arguments

1. Applicant's arguments filed 6/24/05 have been fully considered but they are not persuasive. In particular, Applicant's argument that Fig. 3 discloses anything else than a GaN-AlGaN high electron mobility transistor appears to suggest that the office action cited APAA for the limitation on InGaN as the material for the barrier layer, however Kim et al was instead cited therefor; while both the specification ([0010]) and the article by Peter Kordos, "GaN-based Electronics" Material and Device Issues" on which Fig. 3 and the discussion thereof in Applicant's specification was stated to be based, teaches a GaN-AlGaN high mobility transistor with the particular polarization property also claimed by Applicant, so it is seen that APAA teaches at least one limitation ("cation-polarity layered structure") in addition to a generic GaN-AlGaN high electron mobility. Furthermore, Applicant's argument that "there is no admission of any motivation" to combine the device of Fig. 3 with the teaching of Kim et al, does not address the specific reasons given by Kim et al and cited in the previous office action as to the superiority of $In_xAl_{1-x}N$ as a barrier material (see page 3 of the office action), while the method of making followed by Kim et al in no way distinguishes from the disclosure on how to make a "cation-polarity" layered structure, namely through MOCVD. In this respect it is noted that a nucleation layer, now claimed "grown to provide a cation-polarity layered structure" is (a) disclosed as nucleation layer (layer 41 in APAA) but not disclosed as being the cause of the cation-polarity layered structure; now is it needed to create said cation-polarity layered structure, as witnessed for example by Asbeck et al

(Electronics Letters, Volume 33, No. 14 (pp. 1230-1231) (cf. first sentence of "Analysis", p. 1230, first column).

2. Finally, the art cited in the Background, in particular the AlGaN/GaN hetero-interface field effect transistors, which are also HEMTs in addition to comprising cation-polarity layered structures and even Applicant calls them so (see [0009]-[0010]). Therefore, in spite of the substantial amendments to the claims they do not appear to overcome the following rejections.

3. Applicant is reminded of the objection to the Drawings, which herewith is repeated.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J. Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

JPM
September 1, 2005